Amphibians.

The amphibious animals are worse represented even than the reptiles, one species of frog (*Liopelma Hochstetteri*) being the only member of the class. This frog has now been found in three distinct localities, all, however, in the province of Auckland: these are, the Cape Colville ranges from Coromandel to Puriri, the Huia on the north side of the Manukau harbour, and the mountains behind Opotiki in the Bay of Plenty. It belongs to a genus not found elsewhere; but its nearest ally is *Telmatobius peruvianus* from Peru, and it should be remembered that the frogs of Australia are also allied to South-American forms. It is evident that the absence of other Batrachians cannot be accounted for by the unsuitability of climate or want of food; for the common green frog of Australia (*Litoria aurea*), which has been introduced, has spread with great rapidity around both Auckland and Christchurch.

The evidence of the reptiles, therefore, is that New Zealand has had land communication with some of the Pacific islands at a later date than with Australia; for in the first case there is no specific difference between forms found in both places, while in the latter the species are now quite distinct. Our frog proves a connexion with South America at a period so remote that changes have since taken place of generic value.

[To be continued.]

VII.—*On the Development of the Polypes and of their Polypary.* By M. H. de Lacaze-Duthiers.*

Last summer the Academy requested the Minister of Marine to permit my embarkation on board the 'Narval,' which was then occupied in completing the hydrography of the Algerian coasts. My object in undertaking this voyage was to study again the coral banks, the richness of which I had previously ascertained in 1860, 1861, and 1862.

During the voyage I have had the opportunity of collecting observations, the results of which, indicated in short notes, do not seem to have been accepted in France. I have been able to verify afresh the facts which I am now going to publish in detail, and I think that I ought first of all to communicate these results to the Academy.

I refer now to the development of polyparies.

* Translated by W. S. Dallas, F.L.S., from the 'Comptes Rendus,' November 24, 1873, pp. 1201–1207.

Science does not possess any extensive and connected work on the embryogeny of the polyparian polypes. Nearly all authors whose object has been the investigation of the mode of growth of the polypary have taken on the one hand the calices or polyparites which appeared to be youngest, and on the other those which seemed to be most completely developed, and then, by seeking the terms intermediate between these extremes, have endeavoured to deduce, from the gradual passage from the former to the latter, the laws either of the multiplication of parts or of the general mode of growth of the calices.

We do not find zoologists attempting to recognize the first traces of calcareous deposits in the bodies of the polypes while still in the state of embryos, and to follow these first inorganic nodules up to the complete formation of the calice or polyparite with all its elements. In a word, they have almost exclusively studied the isolated skeleton of the animal, or the polypary itself.

Laws, which we find prevailing in science, *have been deduced, not from the study of the framework during its formation in the embryo, but from the observation of the formed polyparites of different dimensions.* In other words, zoologists *have thought that they could affirm what must have been from what was at the moment of observation.*

In a polyparite (that is to say, in one of the calices of the polypary of an Actiniarian of whatever species) it is well known that there are radiating laminæ of various sizes. These laminæ of the first, second, third, to *n*th size alternate regularly in a certain order. The totality of those which are homologous or similar constitutes what is called a *cycle*. Seeing this, the same thought comes naturally to the mind of every observer; and it may be said that, in everybody's opinion, the equal laminæ forming a cycle are produced at the same period—that they commenced and continued growing simultaneously, which would explain their equality—and, finally, that the laminæ of different sizes are also of different ages, and that their extent is in direct proportion to the duration of their growth (that is to say, their age).

It may certainly be affirmed that this idea, which occurs naturally to the mind, has been the starting-point of the numerous laws formulated from the examination of specimens in collections—laws which have furnished the principal foundation for the classifications and for the nomenclature of the parts of polyparies, proposed especially by French authors. Certain German naturalists, particularly MM. Schneider and Rötteken on the one hand and C. Semper on the other, taking

up different points of view, have endeavoured to demonstrate the invalidity of these laws and the difficulty or impossibility of verifying or applying them which often exists.

One of my wishes when I went to Africa this summer was to find embryos and very young individuals of polyparian polypes, and to revise, with the view of verifying them, the various theories put forward as to the origin and mode of growth of polyparies. I was fortunate enough to obtain both embryos and very young polypes; and I have now the honour to present the results of my new observations to the Academy.

It is well known that the polype which clothes and produces a polypary presents round its mouth circlets of tentacles or arms of different sizes, that these tentacles have also been grouped in cycles, and that the same series of laws has been applied to their development as to that of the laminæ of the polypary. Now, by following the appearance of the tentacles upon the embryo, we cannot verify any of the laws which we find current; and this I proved in a memoir published last year*.

This causes great perturbation of mind when we desire to pass from the study of the soft parts of the animal to the knowledge of the development of its hard parts. In fact, each tentacle corresponds to a chamber in the body of the polype; and at the bottom of each of these chambers there rises one of the calcareous laminæ of the polypary. The question therefore arises at once, whether the chamber and the tentacle belonging to it, as also the calcareous septum which occupies it, follow the same or different laws in their formation.

I have been able during my voyage to ascertain the perfect exactitude of the following facts.

Two questions presented themselves. It was necessary, in the first place, to determine in what part and what elementary stratum of the organs the deposition of the calcareous particles of the calice commenced, and then what were the laws governing the appearance and multiplication of the parts of the polypary.

It was logically necessary, in order to trace the progress of the development of the calcareous parts, to know in the first place, just as in the case of the bones, where the first particles were deposited.

French authors suppose that it is in the dermis of the body of the polypes that the principal deposit takes place, and therefore they give the name of *Sclerodermi* to the group of corals here under consideration; but it must be remarked that it

* Archives de Zoologie expérimentale et générale, vol. i. 1872.

would be useful at starting to give a precise histological definition of the dermis, which has never been done. Now-a-days two layers are distinguished in the body-walls of polypes, an inner and an outer one, called the *ectoderm* or *ectothelium* and the *endoderm* or *endothelium*. French authors have spoken of these two layers; but they have subdivided them into numerous secondary layers separated by a plane of muscular fibres. It is therefore outside this muscular layer that the primitive deposition of the part which in their eyes is the most important takes place, namely that which forms the walls of the calice (*theca*).

Now the embryogeny and histology of the embryo, studied in young living *Astroides* of all ages, and not in polyparies at some given moment of their existence deprived of their soft parts, show without any possibility of doubt that the first calcareous nodules occur and appear in the inner layer or *endothelium*, the histological characters of which are absolutely different from those of the outer layer, which does not allow us to confound them.

Thus, as regards the histological origin of the polypary, it is impossible to continue to accept the old opinion, and consequently also the denomination Sclerodermi.

With regard to the law governing the mode of appearance of the septa of the polypary, the following appears to us to be no less certain. The primitive calcareous nodules first deposited, making their appearance in the thickness of the inner layer, clothe the bottom of the cavity of each chamber of the embryo while it is still without tentacles, and unite together to form usually a central band at the bottom of the chamber, this band being simple towards the middle of the body and bifurcate towards the circumference; so that at one moment we find at the bottom of each chamber a sort of calcareous Y, the branches of which turned outwards may be either very short or very long.

It is to be remarked that at this period there is no trace of any circumvallation or wall (*theca*), or exterior boundary of the calice.

By following these first deposits we find that they rise more and more beneath the inner layer, and that filling up the fork of the Y they produce projecting simple laminæ, one in each chamber of the embryo. These laminæ (the origins of the *septa*) become soldered to foreign bodies underlying the embryos, and constitute the first rudiments of the polypary.

Now, there are twelve chambers; there are consequently twelve primitive septa, and, I repeat, no wall. Nevertheless, by the examination only of the polyparies in collections,

zoologists have been led to assume that the wall was first developed, and that from it there originated first of all six septa at the same time, that these six primary laminæ, retaining the advance given to them by their age, were the largest septa in the adult, and so on for the septa of the second and third to the *n*th size. From this we have the admission of cycles the age of which was shown by the size of their elements. Nothing of this kind ever occurs in the embryo of *Astroides* or of the *Balanophylliæ*; and I have numerous examples of very young individuals all having twelve equal septa before possessing any wall, and in which the formation of cycle after cycle of six elements is not admissible.

It is no longer possible to admit that the septa originate from the wall, and to give the latter the preeminence over all other elements of the calice, since the septa are already well formed when there is no trace of a wall.

Thus as regards the first two cycles the laws according to which the absolute and relative moment of appearance of the septa and their origin as dependent on one of the elements of the calice were supposed to be governed have no foundation (*raison d'être*); and yet it was especially for these two cycles that these laws were accepted and most easily verifiable. With regard to histological origin it does not seem to us to be possible, at least in the embryo and the species investigated, to continue to attribute it to the dermic layer.

We recognize, therefore, at the origin of the polypary, a rule which does not fail with regard to the mode of multiplication of the tentacles in the Actiniaria without polyparies; and it is as follows :—The number of parts in accordance with a certain typical number is first formed; afterwards, a greater growth being manifested in certain of these formed parts, there results from it a symmetry which nothing could lead us to foresee if the embryo had not been followed from moment to moment.

It is thus that the tentacles of the *Actiniæ*, which we find sometimes arranged so regularly in successive cycles in accordance with the type 6 (6 of the first, 6 of the second, 12 of the third, 24 of the fourth, and 48 of the fifth magnitude) are far from having been developed 6 at a first period, 6 at a second, 12 at a third, and so on. The number 12 was first produced, passing successively through the inferior numbers 2, 4, 6, and 8 to 12. After its production the sizes alternately remained stationary in 6, and increased in 6 others. Then, but only then, was manifested the radiate symmetry with two cycles apparently of different ages, as indicated by the relation $(6_1 + 6_2)$.

It is the same with the septa of the polypary. The number 12 is first of all produced, but with this difference, that the 12 elements all begin to show themselves at the same moment; and it is only later on that their unequal growth ranges them in two groups which appear to be of different age, whereas they are only of different sizes.

The facts here brought forward appear to us to be of absolute certainty. They have been repeatedly confirmed, sometimes upon polypes taken swimming in the sea in the form of the embryonic sphere without any divisions, and brought up until the complete formation of their polypary, which was affixed to the walls of the microscopic cells in which they were kept for observation, which enabled us to follow under the microscope a single embryo, of which the origin of the parts and the formation of the framework might thus be watched—and sometimes also upon very young individuals collected on the rocks of the localities inhabited by *Astroides* or *Balanophyllia*.

VIII.—*On the Structure of the Skeleton of* Euplectella aspergillum. By Thomas Higgin, Member of the Liverpool Microscopical Society. (In a Letter to T. J. Moore, Curator of the Free Public Museum, Liverpool.)

[Plate III.]

[The specimen referred to in the following paper is one of two examples purchased of Mr. Geale in November 1866. It is 12 inches in length measured along the outer curve, and of a very uniform diameter of 1 inch. The other specimen is somewhat longer and stouter. Both are in a more natural condition than is seen in the examples usually submitted for sale; and both are of a pale brown colour. The smaller specimen is somewhat compressed towards the top, perhaps owing to pressure while drying; and nearly half the lid-like top is torn away, leaving a jagged edge, marring the beauty of the specimen. The lower third of the sponge is rigid, the rest soft and yielding throughout, the rigidity extending somewhat higher upon the inner than on the outer side of the curve.

It is, as Mr. Higgin supposes, the specimen referred to by Prof. Wyville Thomson in his "Letters from H.M.S. Challenger," published in 'Good Words' for July 1873, p. 510. On passing through Liverpool to Belfast in December 1868, he paid a hurried visit to the Museum, saw both examples, and I gave him a fragment from the smaller one for use under the microscope. It is remarkable that all the specimens